

**BY ORDER OF THE COMMANDER
SPACE AND MISSILE SYSTEMS
CENTER**

**SPACE AND MISSILE SYSTEMS CENTER
INSTRUCTION 62-110**

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Developmental Engineering

**SPACE DEBRIS MITIGATION
MANAGEMENT**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This Space and Missile Systems Center (SMC) Instruction (SMCI) implements SMC Space Debris Policy and Requirements set forth in National Space Policy, Department of Defense Instruction (DoDI) 3100.12, Space Support and Air Force Instruction (AFI) 91-217, Space Safety and Mishap Prevention Program by assigning responsibilities and establishing procedures for SMC in the mitigation and control of space debris. Among the core responsibilities of all space programs/projects is the long-term sustainability of space. This requires the assessment and minimization of orbital lifetime, released debris on orbit and probability of collision and explosion in all earth orbits. In addition, the environmental and public safety impacts from randomly reentering space debris must be mitigated in accordance with (IAW) current policy. Failure to incorporate debris management early in the system design process will increase space system vulnerabilities and lead to decreased satellite space situational awareness.

The policy for SMC missions is full compliance with national, Department of Defense (DoD), United States Air Force (USAF) and SMC space debris requirements and applicable SMC standards. The Office of the Secretary of Defense (SECDEF) has directed SMC to develop a plan to eliminate debris exceptions reported through the SECDEF (see Section 1.2.2). This SMC Instruction initiates this process. New policies subsequently published at higher levels that conflict with this SMCI shall take precedence. This instruction uses the terms SPO Director, Program Director (PD) and Program Manager (PM) as defined by higher-level directives and current SMC definitions.

In this SMCI, the terms spacecraft and space vehicle (SV) are used interchangeably. Within the context of the space debris discussion, they mean the same thing: any hardware which is managed by SMC, apart from non-orbiting launch vehicle (LV) components, launched on an orbital mission (defined below). The hardware (and hardware required for separation) will require space debris risk analysis and mitigation.

This SMCI shall be reviewed and updated consistent with policy changes and periodically as required by current publication instructions. Any suggested changes or comments are to be submitted to the Office of Primary Responsibility (OPR: SMC/ENC) for consideration and disposition. Current debris reference documents are available from EN upon request.

Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the AF Form 847, Recommendation for Change of Publication; route the AF Form 847 from the field through the base publications/forms managers. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, Management of Records, and disposed of IAW Air Force Records Disposition Schedule (RDS) located in the Air Force Records Information Management System (AFRIMS).

1. Space Debris Management Overview. Space debris mitigation management shall be an integral part of the design as well as the review processes defined in SMC Standard 21 (SMC-S-021), Technical Reviews and Audits for Systems Equipment and Computer Software. Space debris mitigation management, where applicable, is also an element in the Systems Engineering Plan (SEP), the Risk Management Plan (RMP), the Programmatic Environment, Safety, and Occupational Health Evaluation (PESHE), the System Safety Management Plan (SSMP), System Safety Program Plan (SSPP), SMC Space Flight Worthiness (SFW) certification, and space debris mitigation reporting. This SMCI requires full compliance with space debris requirements through judicious design, operation, disposal and trade study analysis. Any decision to deviate from compliance requirements shall be recommended by the PM and/or Program Director and made by the SMC/CC (AFPEO/SP) based on an assessment of the scope, magnitude, risk/benefit and impact of the space debris hazard through the asset's end-of-life disposal.

1.1. Purpose and Scope. This Instruction provides direction, roles and responsibilities to ensure that SMC debris mitigation policies and processes are assessed and incorporated throughout the acquisition life cycle.

1.2. National Space Debris Policy, Requirements and Regulations.

1.2.1. Under The United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty, 1967), the US is liable for property damage or human casualty resulting from US space objects. Failure to adequately assess reentry risk could lead to property damage and human casualties from uncontrolled, random reentries.

1.2.2. The US National Space Policy (NSP) requires United States (US) agencies to minimize space debris and preserve the space environment. The NSP directs the US to follow the United States Government (USG) Orbital Debris Mitigation Standard Practices (ODMSP), consistent with mission requirements and cost effectiveness, in the

procurement and operation of launch services and spacecraft and in the conduct of tests and experiments in space. For SMC programs that are noncompliant with the USG ODMSP, the NSP requires an approval from the Office of the Secretary of Defense for an Exception to [National Space] Policy (EtP).

1.2.3. In accordance with DoDD 3100.10, Space Policy, “DoD will promote the responsible, peaceful and safe use of space, including following the US Government (USG) Orbital Debris Mitigation Standard Practices ... ” In addition, DoD Instruction (DoDI) 3100.12 paragraphs 6.3 and 6.4 require the minimization of orbital debris and planning for end of mission life for programs involving on-orbit operations, consistent with USG ODMSP.

1.2.4. SMC programs and projects must also comply with Air Force Instruction (AFI) 91-217, Space Safety and Mishap Prevention Program, which is more specific than the NSP and DoD requirements. The AFI contains design and operational requirements and mandates that programs/projects assess the spacecraft and upper stage(s) for compliance with the requirements. A summary of the analysis and documentation of the magnitude of noncompliance and the rationale for noncompliance shall be included in the LV Space Debris Assessment Report (SDAR) and SV combined SDAR and End of Life Plan (SDAR/EOLP) in accordance with the content and format specified in AFI 91-217. The requirements for these documents specified by AFI 91-217 are in addition to the USG ODMSP [or NSP] requirements for an approved EtP.

1.2.4.1. As part of normal program execution, documentation of risk acceptance for AFI 91-217 noncompliances and EtP approvals for NSP noncompliances shall be included with the SDAR/EOLP pre-launch package. Secondary or auxiliary payloads are monitored for space debris as they are planned, with different procedures applying depending on whether the host is a military or commercial vehicle.

1.2.4.2. SMC payloads permanently attached to Other Government Agency (OGA) SVs shall comply with the OGA's space debris policies. SMC payloads permanently attached to commercial SVs shall comply with the commercial SV space debris requirement. SMC payloads permanently attached to LV components that remain in orbit shall comply with DoD and AF space debris policy. If there are multiple payloads from multiple entities attached to the LV components that remain in orbit, the SMC program office shall create an MOU to establish space debris policy governance (OGA, Commercial and DoD).

2. Roles and Responsibilities.

2.1. SMC Commander (SMC/CC)

2.1.1. Certify space flight worthiness for all AFSPC LVs and SVs IAW AFSPCI 10-1208, Spacelift Operations.

2.1.2. Ensure that required debris mitigation actions are incorporated into SMC SV, LV and secondary/auxiliary payload program decisions, as applicable.

2.1.3. Review and approve space debris assessment documents.

2.2. Air Force Program Executive Officer for Space (AFPEO/SP)

2.2.1. Decide, consistent with AF policy, on strategies to mitigate space debris and/or resolve space debris mitigation compliance issues as required.

2.3. Program Manager.

2.3.1. Proactively manage programs/projects for space debris compliance.

2.3.2. Brief the space debris compliance status of their programs at Program Management Reviews (PMRs) or similar venues.

2.3.3. Plan for total mission (SV plus LV) compliance, within program cost, schedule and performance parameters. Debris mitigation shall be addressed in a life cycle approach that covers concept development, system design, mission design, launch, testing, operations, disposal, reentry and recovery, as applicable. The PM's appropriate systems engineering Integrated Product Team (IPT) acts as a forum to address debris mitigation approaches, analyses, trade studies and policy implementation and verification. If total mission compliance is not feasible, coordinate with SMC/EN to supply required data for risk acceptances and EtP submittals.

2.3.4. Produce SV SDAR/EOLPs, and LV PMs shall produce SDARs, IAW AFI 91-217.

2.3.5. Coordinate with SMC/EN and SMC Safety Directorate (SMC/SE) during space debris mitigation trades for total SV plus LV mission compliance throughout mission development.

2.3.6. Assess the scope, magnitude and mitigation alternatives to reduce space debris non-compliance impacts through end-of-life disposal. Any non-compliance shall be managed to limit the risk to other users of space.

2.3.7. Include space debris mitigation analysis and compliance status in acquisition strategies, program technical reviews, program management reviews or equivalent reporting events.

2.3.8. SMC auxiliary or secondary orbital system PMs shall coordinate with SMC/EN on the applicable space debris requirements.

2.4. SMC Staff Offices.

2.4.1. Support PMs in space debris compliance/mitigation as described in this instruction.

2.5. SMC/EN.

2.5.1. Publish, maintain, implement and review the SMCI on Space Debris Policy as the owner of the SMC space debris mitigation process.

2.5.2. Administer the SMC Space Debris Working Group (SDWG) IAW the approved SMC SDWG charter.

2.5.3. Develop an enterprise level approach/strategy for mitigating the effects of debris on delivering military capabilities.

2.5.4. Chief Systems Engineer

2.5.4.1. Serve as the SMC technical review authority for space debris mitigation documents.

2.5.4.2. Review space debris mitigation activities and product summaries.

2.5.4.3. Provide direction to address space debris compliance requirements.

2.6. SMC Environmental Management Division (SMC/ENC)

2.6.1. Work with the LV and SV SPOs to develop and coordinate SDARs and EOLPs IAW AFI 91-217 and applicable EN policy.

2.6.2. Coordinate with the SV and LV SPOs, throughout the design of the mission, to consider mission trade studies and other alternatives to achieve SV and LV compliance IAW Section 2.3.

2.6.3. Work with the SV, LV and auxiliary system(s) programs to develop and coordinate EtP requests as required.

2.6.4. Participate in discussions/activities/actions on orbital debris policy and disposal topics with HQ Air Force Space Command, Air Force Safety Center and other United States Government agencies (e.g., NASA, FAA) as well as commercial space operators.

2.7. SMC/SE.

2.7.1. Serve as the SMC system safety advisor.

2.7.2. Review and coordinate SV SDAR/EOLPs and LV SDARs IAW AFI 91-217.

2.8. SMC System Safety Division (SMC/SES).

2.8.1. Work with the LV and SV SPOs to coordinate LV SDARs and SV SDAR/EOLPs IAW AFI 91-217.

2.8.2. Coordinate with the SV and LV SPOs, throughout the design of the mission, to consider mission trade studies and other alternatives to achieve SV and LV compliance IAW Section 2.3.

2.9. SMC Judge Advocate Contract and Patent Law Division (SMC/JAQ)

2.9.1. Serve as the legal advisor for SMC on the legal sufficiency of space debris management documents where impacts pose public and environmental risk in excess of the established normal criteria.

3. Process Requirements.

3.1. SMC/EN policy implements the space debris mitigation management process IAW applicable regulations as referenced in Attachment 1.

ELLEN M. PAWLIKOWSKI, Lt General, USAF
Commander

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

United States National Space Policy (NSP), 28 June 2010

United States Government Orbital Debris Mitigation Standard Practices (USG ODMSP)

Department of Defense Directive (DoDD) 3100.10, Space Policy, 18 October 2012

Department of Defense Instruction (DoDI) 3100.12, Space Support, 14 September 2000

Air Force Instruction (AFI) 91-217, Space Safety and Mishap Prevention Program, 17 April 2014

SMC Standard SMC-S-015, End-Of-Life Disposal of Satellites in Geosynchronous Altitude, 13 June 2008

SMC Standard SMC-S-022, End-Of-Life Disposal of Satellites in Low-Earth Orbit, 19 March 2010

EN OI 62-217, SMC/EN Space Debris Mitigation Management Process, 2014

Adopted Form

AF form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPEO/SP—Air Force Program Executive Officer for Space (dual hatted as SMC/CC)

AFRIMS—Air Force Records Information Management System

DoD—Department of Defense

DoDI—DoD Instruction

EOLP—End-of-Life Plan

EtP—Exception to National Space Policy

FAA—Federal Aviation Administration

FCC—Federal Communications Commission

FRR—Flight Readiness Review

IAW—In Accordance With

IPT—Integrated Product Team

LV—Launch Vehicle

NASA—National Aeronautics and Space Administration

NSP—US National Space Policy

ODMSP—Orbital Debris Mitigation Standard Practices
OGA—Other Government Agency
OI—Operating Instruction
OPR—Office of Primary Responsibility
PESHE—Programmatic Environmental Safety and Health Evaluations
PD—Program Director
PM—Program Manager
PMR—Program Management Review
RDS—Records Disposition Schedule
RMP—Risk Management Plan
SDAR—Space Debris Assessment Report
SDWG—Space Debris Working Group
SEP—Systems Engineering Plan
SECDEF—Secretary of Defense
SFW—Space Flight Worthiness
SMC—Space and Missile Systems Center
SMC/EN—SMC Engineering Directorate
SMC/ENC—SMC Environmental Management Division
SMC/CC—SMC Commander (dual hatted as AFPEO/SP)
SMCI—Space and Missile System Center Instruction
SMC/JAQ—Judge Advocate General Contract and Patent Law Division
SMC/SE—SMC Safety Directorate
SMC/SES—SMC System Safety Division
SPO—System Program Office
SSMP—System Safety Management Plan
SSPP—System Safety Program Plan
SV—Space Vehicle
US—United States
USG—United States Government
USAF—United States Air Force